

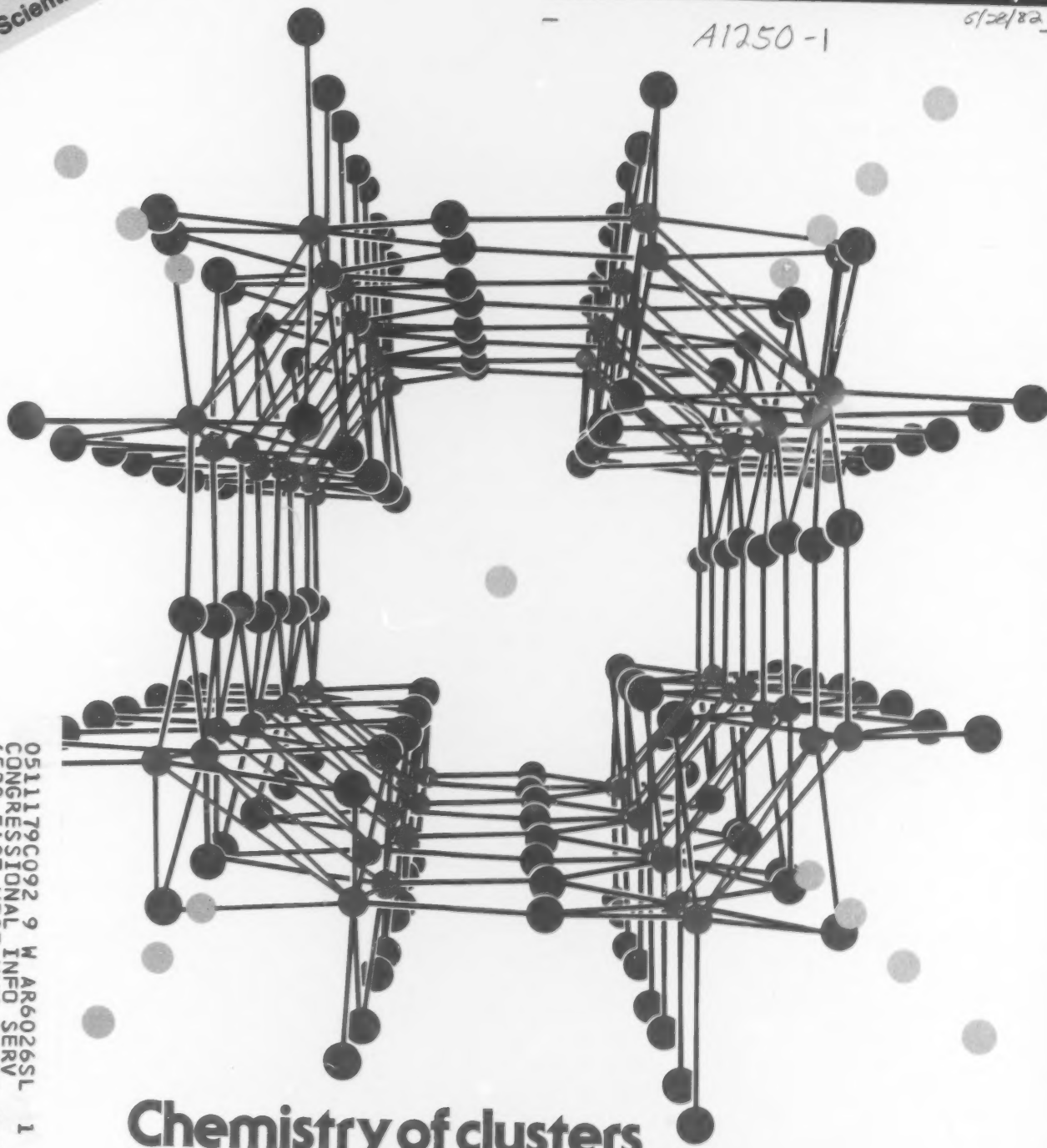
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**Chemical &
Engineering**

NEWS

A1250-1

5/28/82



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**Chemistry of clusters
with metal-metal bonds**
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Cover: Metal cluster $\text{Ba}_{1.13}\text{Mo}_6\text{O}_{16}$, characterized by Robert E. McCarley of Iowa State University, Ames, forms an infinite array. Oxygen atoms are shown as blue, molybdenum as magenta, and barium as green

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Technology

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Chemical & Engineering News

1155—16th St., N.W., Washington, D.C. 20036

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Subscription Rates 1982. Printed or microfiche editions: nonmembers U.S. 1 yr. \$30, 2 yr. \$56; outside U.S. 1 yr. \$54, 2 yr. \$106. Air freight rates available on request. Rates above do not apply to nonmember subscribers in Japan, who must enter subscription orders with Maruzen Co. Ltd., 3-10 Nihonbashi 2-chome, Chuo-ku, Tokyo 103, Japan. Tel: (03) 272-7211. Single copies: Current \$1.75. Rates for back issues and volumes are available from Distribution Office, ACS, 1155—16th St., N.W., Washington, D.C. 20036. An annual index is available for \$35 at the same address. Back and current issues available on microfilm and microfiche. For information, contact Microform Program, ACS.

Chemical & Engineering News (ISSN 0009-2347) is published weekly except for the last week in December by the American Chemical Society at 1155-16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices. POSTMASTER: Send address changes to Membership & Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. ACS assumes no responsibility for the statements and opinions advanced by the contributors to its publications.

Advertising Management
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Letters

Scientific manpower shortage

SIR: The irony of your juxtaposition of two mutually contradictory reports on the scientific manpower shortage (C&EN, May 17, pages 28 and 29) was not lost on your readers. The articles entitled "Improved science, math education urged" and "Demand wanes for new chemical engineers" illustrates perfectly how the bureaucracy can get 180° out of phase with the national scene. What fodder for the Libertarian Party!

Arthur Bradley

Floral Park, N.Y.

Natural and human resources

SIR: In a technical society such as the U.S., it is the efficiency and creativity with which we use our natural and human resources that determines the quality of our existence. This is a nontechnical way of stating that we must be fully cognizant of both the potentials and limitations of chemical thermodynamics. We seek a future trend for our R&D; it can be derived from the above thesis.

Both the wisdom of Thomas Wolfe's you can never go back and the Second Law point to the vector quality of time's arrow. We must look forward, not back, to an improved quality of life rather than mere increase of the GNP. Hence, it is most distressing that government R&D expenditures seem to be channeled into enterprises which can no longer be classed as having future potential: the nuclear-military complex, the depletion of our irreplaceable resources, and the stimulation of wasteful transportation methods. It is even more alarming that at least one university administrator has supported the first of these activities, apparently to attract government funds. The present anticonservation policy is bad thermodynamics, and hence is bad economics and bad politics.

We must look to new basic knowledge for ways to invest in the future of America. Improved creativity depends on improved scientific communication, and the shifting of the R&D load to industry of a size commensurate to the work at hand. When we create massive conglomerates, we may secure a quick profit, but the reinforced bureaucracy destroys creativity and communication for the long pull. We reduce the quality and the second-law efficiency of the operation. There is a lesson to be learned from the fact that the "second 50" are outperforming the "first 50" (C&EN, May 10, page 21).

It remains to create an economic climate favorable to these newer developments of our science. Reduction of interest rates, reduction of the ratio of federal expenditures to GNP (now nearly 24%), elimination of capital gains taxes (but increase holding time to five years) will all stimulate investment, rather than trading or buying government paper. The "bracket creep" of the excess profits tax should be modified to provide a sliding scale varying logarithmically

from 0% at \$100,000 to, say, 60% at \$1 billion, so that the stagnation and bureaucracy inherent in large size is not further encouraged. The track record of the small to medium-sized technically oriented company in terms of creativity, communication, and efficiency is excellent; let's give them a clear track!

It is to the "middle class" in American technical enterprise that we must look for the future. Their creativity and productivity can restore an economy which is being destroyed by the thermodynamically unsound double-whammy of subsidized waste and a record government deficit.

Winslow H. Hartford

Emeritus Professor, Environmental Science,
Belmont Abbey College, Charlotte, N.C.

Favors two annual meetings

SIR: "Is there a need for two ACS national meetings per year?" (Fred Basolo, president-elect, ACS, C&EN, May 17, page 32). Yes, definitely there is a need. The two annual meetings are the cement which hold ACS members of this big country together. Having only one national meeting per year and shifting the emphasis on presentation of papers, meeting with colleagues, renewing contacts, etc., to regional meetings is, in my opinion, the first and unfortunately, rather effective, step toward a fragmented ACS.

I also have difficulties in agreeing with the main reasoning of Basolo for abandoning the second annual meeting, namely saving money. Up to very recently there was the philosophy that money can overcome all problems. Now it seems another and equally simplistic point of view comes into vogue, namely saving is the cure for everything. If we want to preserve the American Chemical Society as the society for all chemists and continue to provide a forum for exchange of ideas for staying in contact with the colleagues in the "Far West," "Way Up East," "Down South," in the "Heartland Midwest," or "Up North" keep the two annual national meetings alive.

Hans Zimmer

Professor of Chemistry, University of Cincinnati

Chemical dependence

SIR: I am an ACS member and a chemist of some 20 years standing. I am also, incidentally, a recovered alcoholic and drug addict who would

Continued on page 74

Correction

• June 7, page 17: The profit margin columns in the right-hand portion of the table are labeled in reverse—the first column is 1981, the second 1980.

Ethylene economics due for slow improvement

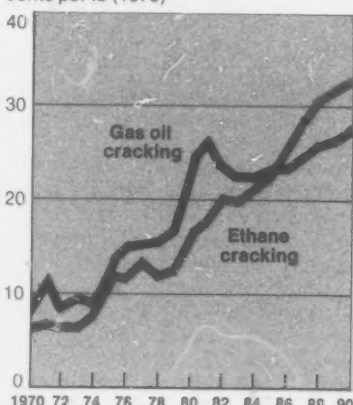
Ethylene, the fulcrum of the organic chemicals business, will follow a course of gradual improvement through the 1980s, according to Stanford Field, consultant to SRI International's Chemical Process Economics Center. Speaking at the Anaheim meeting of the American Institute of Chemical Engineers earlier this month, he said that ethylene prices, although weak through 1983, will rise, but slowly at first. Plant use also will climb slowly, but new plants may not appear until late in the decade.

According to Field, ethylene demand will grow at about 4% per year, a rate greater than the growth rate of gross national product. Ethylene imports, mainly from Canada, will reach 1.5 billion lb per year by 1990, although the U.S. probably will remain a net exporter of ethylene derivatives. Capacity utilization of ethylene plants in the U.S. probably will rise slowly; and new plant construction should not be expected before 1985 and probably sometime late in the decade.

Field bases his ethylene outlook on several key assumptions: for instance, that GNP will grow at a constant-dollar rate of 3% per year through 1990, and that inflation will remain slightly less than 8%. The world's oil supply, one of the two main ethylene sources (the other source is natural gas), will continue to be dominated by the Organization of Petroleum Exporting Countries, he assumes. Field says that oil demand will grow only 1 or 2% per year. This lessening in demand will prompt Saudi Arabia to maintain current-dollar price of light crude at \$34 per bbl for the rest of 1982. For 1984 and 1985, Field ex-

Gas oil will be a cheaper feedstock than ethane

Ethylene production cost, cents per lb (1979)



Source: SRI International

pects the constant-dollar price of light crude to remain steady and the actual price to increase about 2.5% per year after 1985 and through 1990.

By the end of the decade, the current-dollar price of light crude will be about \$70 per bbl, Field predicts, unless there is a prolonged worldwide economic decline. In that case, he says, there might even be a decline in crude prices.

Price margins over costs in the oil business in the 1980s likely will rise owing to more expensive products (such as higher-octane gasoline), higher costs for environmental protection, and higher profits. However, the profitability won't be nearly so good as it was in the 1970s. Field also expects to see the shutdown of a total of 1 million bbl per day of uneconomic

refinery capacity in the 1980s because of refiners' adjusting to "structural changes" in oil use.

The price of natural gas, the other main raw material, also is a key element in ethylene economics. Natural gas pricing is a bit chaotic at the moment, and Field notes that the recent oil price rise coupled with decontrol of U.S. crude prices in 1982 has caused an acute disparity between the price of gas and that of oil. Field assumes for his scenario that natural gas prices will be decontrolled more or less on schedule, that is in 1985, despite various attempts to do it sooner.

Much additional confusion in the gas picture derives from the plethora of gas categories—for example, interstate gas, stripper well gas, Prudhoe gas, incentive gas, new gas, and imported gas. New gas was assumed to be the swing material that would balance requirements.

In general, Field believes that most gas prices will rise to the level of imported gas, with Canada being the principal source of imports. The present Canadian oversupply is expected to disappear in the late 1980s, when Canada completes its gas pipeline to the eastern provinces. The imported Canadian gas price will rise to reach parity with low-sulfur residual fuel oil in the U.S. Field predicts that the average rate of natural gas to local distributors will rise from 54¢ of low-sulfur fuel oil price in 1981 to 93¢ in 1990.

The ethane raw material fraction of natural gas has been in good supply at low cost because of the federal government's control of old gas prices. The supply of low-cost ethane is not expected to be sufficient, however, to meet demand beyond 1983.

By 1985, Field says, demand for ethane from all sources is expected to exceed supplies. And beyond 1986 it probably will not be profitable to use ethane as a substitute feedstock in naphtha and oil steam crackers, he believes.

By 1986 any large new ethane cracker probably would be the highest-cost source of ethylene and the main factor in determining the price of ethylene, Field says. Not only will no new steam crackers come on stream after 1985, but ethane cracking may no longer show a profit in some cases.

Field admits that ethylene prices will remain weak until the end of 1983, when low-cost ethane runs out. In 1984 and 1985, the price will rise modestly, and thereafter until 1990, price rises will be steeper. □

Ethylene price will accelerate in late 1980s

	1970	1977	1980	1984	1986	1990
Ethylene supply (billions of lb per year)	18.1	25.4	27.8	35.1	36.0	40.7
Production	18.1	25.4	27.8	34.8	35.4	39.2
Derivative imports	—	—	—	0.3	0.6	1.5
Ethylene capacity (billions of lb per year)	20.0	32.2	39.0	41.7	43.0	47.8
C ₂ -based	12.2	12.5	13.1	13.1	12.8	12.3
C ₃ - + C ₄ -based	3.1	5.7	5.9	6.2	6.5	7.0
C ₅ - and higher-based	4.7	14.0	20.0	22.4	23.7	28.5
Overall capacity utilization	91%	79%	71%	83%	82%	82%
Ethylene price						
1979 (cents per lb)	5.7	14.7	21.8	22.5	23.5	31.3
Current (cents per lb)	3.2	12.6	23.8	33.2	40.9	72.8

Source: SRI International